

CLAIMS

1. (currently amended) A signal synthesizer comprising a loop filter connected between a charge pump and an oscillator of the signal synthesizer to accumulate charge from the charge pump and generate at least a first control signal for the oscillator, the loop filter comprising:
a damping capacitor connected at a first node to a resistor connected to the oscillator to generate the first control signal for the oscillator;
a matching capacitor;
sensing-and-canceling circuitry connected to the damping capacitor and to the matching capacitor and adapted to (1) drive a voltage across the matching capacitor to match a first reference voltage applied to an input of the sensing-and-canceling circuitry and (2) generate, based on a first current associated with driving the voltage across the matching capacitor, a second current applied to the damping capacitor to compensate for leakage current in the damping capacitor;
transconductor circuitry connected to the first node; and
a transconductor capacitor connected to the transconductor circuitry and the oscillator to generate a second control signal for the oscillator.

2. (previously pending) The invention of claim 1, wherein:
the signal synthesizer is a PLL;
a first side of the resistor is connected to the damping capacitor at the first node;
a second side of the resistor is connected to both the charge pump and the oscillator; and
the first control signal is generated based on a second voltage at the second side of the resistor.

3. (original) The invention of claim 1, wherein the oscillator is adapted to use the first control signal for steady-state control of the synthesizer.

4. (previously pending) The invention of claim 1, wherein the sensing-and-canceling circuitry comprises:
an operational amplifier (op amp) adapted to generate a voltage difference signal based on a difference between the voltage across the matching capacitor and the first reference voltage;
a first transistor connected (1) to receive the voltage difference signal from the op amp at a gate of the first transistor and (2) to apply a first transistor output signal to the matching capacitor; and
a second transistor connected (1) to receive the voltage difference signal from the op amp at a gate of the second transistor and (2) to apply a second transistor output signal to the damping capacitor.

5. (original) The invention of claim 1, wherein gate oxide thickness of the damping capacitor is substantially less than about 50 Angstroms.

6. (original) The invention of claim 5, wherein the gate oxide thickness of the damping capacitor is about 17 Angstroms or less.

7. (original) The invention of claim 1, wherein the sensing-and-canceling circuitry is adapted to generate the second current as a scaled version of the first current based on a capacitance ratio between the damping capacitor and the matching capacitor.

8. (canceled)

9. (previously pending) The invention of claim 1, wherein gate oxide thickness of the transconductor capacitor is substantially less than about 50 Angstroms.

1 10. (original) The invention of claim 9, wherein the gate oxide thickness of the
2 transconductor capacitor is about 17 Angstroms or less.

1 11. (previously pending) The invention of claim 1, wherein the oscillator is adapted to use
2 the second control signal to set a center frequency for the oscillator.

1 12. (currently amended) The invention of claim 1, wherein the ~~loop filter further~~
2 transconductor circuitry comprises an analog transconductor (gm) cell connected between (1) the first
3 node and (2) the transconductor capacitor, wherein the gm cell is adapted to generate a first gm output
4 signal based on a difference between the voltage at the first node and a second reference voltage applied
5 to an input of the gm cell, wherein the first gm output signal is applied to the transconductor capacitor.

1 13. (original) The invention of claim 12, wherein the second reference voltage is equal to
2 the first reference voltage.

1 14. (currently amended) The invention of claim 12, wherein the ~~loop filter further~~
2 transconductor circuitry comprises a digital gm path adapted to (1) digitally accumulate differences
3 between the voltage at the first node and the second reference voltage and (2) generate a second gm
4 output signal based on the accumulated differences, wherein the second gm output signal is also applied
5 to the transconductor capacitor.

1 15. (previously pending) The invention of claim 14, wherein the digital gm path comprises:
2 a comparator adapted to generate digital differences between the voltage at the first node and the
3 second reference voltage;
4 an accumulator adapted to accumulate the digital differences; and
5 a converter adapted to convert the accumulated digital differences from the accumulator into the
6 second gm output signal.

1 16. (currently amended) The invention of claim 1, wherein the ~~loop filter further~~
2 transconductor circuitry comprises a digital gm path adapted to (1) digitally accumulate differences
3 between the voltage at the first node and the second reference voltage and (2) generate a gm output
4 signal based on the accumulated differences, wherein the gm output signal is applied to the
5 transconductor capacitor.

1 17. (previously pending) The invention of claim 16, wherein the digital gm path comprises:
2 a comparator adapted to generate digital differences between the voltage at the first node and the
3 second reference voltage;
4 an accumulator adapted to accumulate the digital differences; and
5 a converter adapted to convert the accumulated digital differences from the accumulator into the
6 gm output signal.

1 18. (original) The invention of claim 16, wherein the converter is a voltage source adapted
2 to generate the gm output signal as a voltage signal.

1 19. (original) The invention of claim 16, wherein the converter is a current source adapted
2 to generate the gm output signal as a current signal.

1 20. (currently amended) A signal synthesizer comprising a loop filter connected between a
2 charge pump and an oscillator of the signal synthesizer to accumulate charge from the charge pump and
3 generate at least a first control signal for the oscillator, the loop filter comprising:

4 a resistor;
5 a damping capacitor connected at a first node to the resistor;
6 a transconductor capacitor connected to generate the first control signal for the oscillator; and
7 a digital gm path connected between the first node and the transconductor capacitor and adapted
8 to (1) digitally accumulate differences between a reference voltage and a voltage at the first node and (2)
9 generate a first gm output signal based on the accumulated differences, wherein the first gm output signal
10 is applied to the transconductor capacitor.

1 21. (original) The invention of claim 20, wherein the signal synthesizer is a PLL.

1 22. (original) The invention of claim 20, wherein gate oxide thickness of the transconductor
2 capacitor is substantially less than about 50 Angstroms.

1 23. (original) The invention of claim 22, wherein the gate oxide thickness of the
2 transconductor capacitor is about 17 Angstroms or less.

1 24. (original) The invention of claim 20, wherein the oscillator is adapted to use the first
2 control signal to set a center frequency for the oscillator.

1 25. (previously pending) The invention of claim 20, wherein the loop filter further
2 comprises an analog transconductor (gm) cell connected between (1) the first node and (2) the
3 transconductor capacitor, wherein the gm cell is adapted to generate a second gm output signal based on
4 a difference between the voltage at the first node and the reference voltage, wherein the second gm
5 output signal is also applied to the transconductor capacitor.

1 26. (previously pending) The invention of claim 20, wherein the digital gm path comprises:
2 a comparator adapted to generate digital differences between the voltage at the first node and the
3 reference voltage;
4 an accumulator adapted to accumulate the digital differences; and
5 a converter adapted to convert the accumulated digital differences from the accumulator into the
6 second gm output signal.

1 27. (original) The invention of claim 26, wherein the converter is a voltage source adapted
2 to generate the second gm output signal as a voltage signal.

1 28. (original) The invention of claim 26, wherein the converter is a current source adapted
2 to generate the second gm output signal as a current signal.

1 29. (currently amended) A signal synthesizer comprising a loop filter connected between a
2 charge pump and an oscillator of the signal synthesizer to accumulate charge from the charge pump and
3 generate at least a first control signal for the oscillator, the loop filter comprising:
4 a resistor connected, on a first side, to the charge pump and the oscillator and, on a second side,
5 to a first node;
6 a transconductor capacitor connected to the oscillator to contribute to the generation of the first
7 control signal for the oscillator; and
8 a digital gm path connected between the first node and the transconductor capacitor and adapted
9 to (1) digitally accumulate differences between (i) a voltage at [[a]] the first node in the loop filter and
10 (ii) a first reference voltage and (2) generate a first gm output signal based on the accumulated
11 differences, wherein the first gm output signal is applied to the transconductor capacitor to compensate
12 for leakage current in the transconductor capacitor.

1 30. (currently amended) The invention of claim 29, wherein the loop filter further
2 comprises:
3 a damping capacitor connected to [[a]] the resistor to generate a second control signal for the
4 oscillator; and
5 sensing-and-canceling circuitry comprising a matching capacitor, wherein the sensing-and-
6 canceling circuitry is adapted to (1) drive a voltage across the matching capacitor to match a first
7 reference voltage and (2) generate, based on a first current associated with driving the voltage across the
8 matching capacitor, a second current applied to the damping capacitor to compensate for leakage current
9 in the damping capacitor.

1 31. (canceled)

1 32. (previously pending) The invention of claim 29, wherein the loop filter further
2 comprises an analog transconductor (gm) cell connected between (1) the first node and (2) the
3 transconductor capacitor, wherein the gm cell is adapted to generate a second gm output signal based on
4 a difference between the voltage at the first node and the first reference voltage, wherein the second gm
5 output signal is also applied to the transconductor capacitor.

1 33. (original) The invention of claim 29, wherein gate oxide thickness of the capacitor is
2 substantially less than about 50 Angstroms.

1 34. (original) The invention of claim 33, wherein the gate oxide thickness of the capacitor is
2 about 17 Angstroms or less.

1 35-36. (canceled)